An 8.385-day eclipsing binary candidate: TIC 328546841

Sean League

Tustin, California. 28 October 2026. Not submitted to VSX.

Abstract

TESS QLP photometry of TIC 328546841 (V = 10.51) shows two minima of similar depth on an 8.385-day period. The star is not one of the catalogued variables in a 5-arcmin VSX cone. 17 primary minima give

$$\mathrm{BJD_{TDB}} = 2459861.17478 + 8.384603\ E$$

with an rms O−C of 1.4 minutes. The ring search quoted BTJD 2861.177 + 8.384610 E, a primary of 0.12 mag lasting about 4.7 hours, and a secondary of 0.084 mag at phase 0.491. Those round numbers are close. The fit moves the epoch by 3 minutes and the period by 0.6 seconds, and it leaves 1.4 minutes rms where the quoted elements leave 3.6 minutes. The primary is 0.117 mag. It stays below 98 percent of normal light for 6.1 hours and below half depth for 4.1 hours, so the 4.7-hour figure sits between those two widths. The secondary falls at phase 0.492, 0.084 mag. Nothing in this note has been submitted to VSX.

1. How the star was found

The screen is the same one described for TIC 422108500: 357 stars with V < 12.5, from 1.50 to 1.60 degrees around V345 Lac, QLP sectors 16, 17, 56, 57, 83 and 84. TIC 328546841 lies 1.512 degrees, 91 arcmin, west of V345 Lac. Sectors 16 and 17 are 30-minute cadence (KSPSAP_FLUX). The later sectors are 200-second cadence (DET_FLUX). Quality flag zero only, each sector divided by its median.

2. The star

TIC 328546841 is TYC 3973-01834-1, Gaia DR3 2005652596567308032, 2MASS J22082074+5430333, UCAC4 723-088149. TIC v8.2 J2000 position, MAST, 28 October 2026: 22h 08m 20.75s, +54° 30′ 33.3″ (RA 332.086438°, Dec 54.509241°). TIC: V = 10.51 ± 0.007, B = 10.678, T = 10.228, l = 100.65°, b = −1.15°. No TIC contamination ratio is set. TIC quotes the Gaia DR2 parallax, 0.717 ± 0.030 mas, and proper motion −4.56, −3.36 mas $\mathrm{yr^{-1}}$. Gaia DR3, ESA TAP, 28 October 2026: parallax 0.700 ± 0.021 mas, proper motion −4.63, −3.55 mas $\mathrm{yr^{-1}}$, G = 10.387, BP = 10.503, RP = 10.162, RUWE 1.39. The two parallaxes agree. The TIC position and the DR3 source agree to 0.09 arcsec.

3. The ephemeris

Both minima trip a threshold at 0.955 of the sector median, and they are only 0.03 apart in flux, so a single period fit that rounds every dip into one cycle is meaningless. The deeper bottoms, sector-median flux 0.903 to 0.908, were kept as primaries. Seventeen of them give

$$T_0 = 2861.17478\ \mathrm{BTJD},\ P = 8.384603 \pm 0.000003\ \mathrm{d}.$$

The formal error on T_0 is 0.4 minutes. The rms residual is 1.4 minutes and the largest is 2.3 minutes. Against a local continuum on the 200-second sectors the primary depth is 0.117 mag. The time below 98 percent of normal light is 6.1 hours. The time below half depth is 4.1 hours.

The shallower bottoms fall at phase 0.492, median of 17 events, range 0.491 to 0.497. Their local depth is 0.084 mag. One event in the set is a poorer bottom (sector-median flux 0.953) and was not used in the phase median's weight beyond being counted in the list of detections. The two depths and the phase match the ring-search description. The secondary is near half phase but not exactly on it.

Sector	Cycle	Mid-eclipse (BTJD)	UTC	Min. flux	O−C (min)
16	-132	1754.4079	2019-09-27 21:41	0.903	+1.1
17	-130	1771.1780	2019-10-14 16:10	0.906	+2.3

Sector	Cycle	Mid-eclipse (BTJD)	UTC	Min. flux	O−C (min)
17	-129	1779.5613	2019-10-23 01:23	0.904	+0.5
17	-128	1787.9459	2019-10-31 10:37	0.907	+0.5
56	-4	2827.6353	2022-09-05 03:09	0.906	-1.6
56	-3	2836.0198	2022-09-13 12:23	0.904	-1.7
56	-2	2844.4046	2022-09-21 21:37	0.905	-1.5
56	-1	2852.7887	2022-09-30 06:50	0.906	-2.1
57	0	2861.1738	2022-10-08 16:04	0.908	-1.4
57	1	2869.5587	2022-10-17 01:19	0.905	-0.9
57	2	2877.9428	2022-10-25 10:32	0.906	-1.8
83	84	3565.4825	2024-09-11 23:29	0.905	+1.5
83	85	3573.8665	2024-09-20 08:42	0.907	+0.6
83	86	3582.2519	2024-09-28 17:57	0.905	+1.7
84	87	3590.6358	2024-10-07 03:10	0.905	+0.8
84	88	3599.0211	2024-10-15 12:25	0.907	+1.7
84	89	3607.4046	2024-10-23 21:37	0.905	+0.1

Table 1. Primary minima of TIC 328546841. The secondary is not in this table. UTC uses JD 2457000.0 = 2014-12-08 12:00. Cycle 0 is the minimum nearest the quoted epoch, in sector 57.

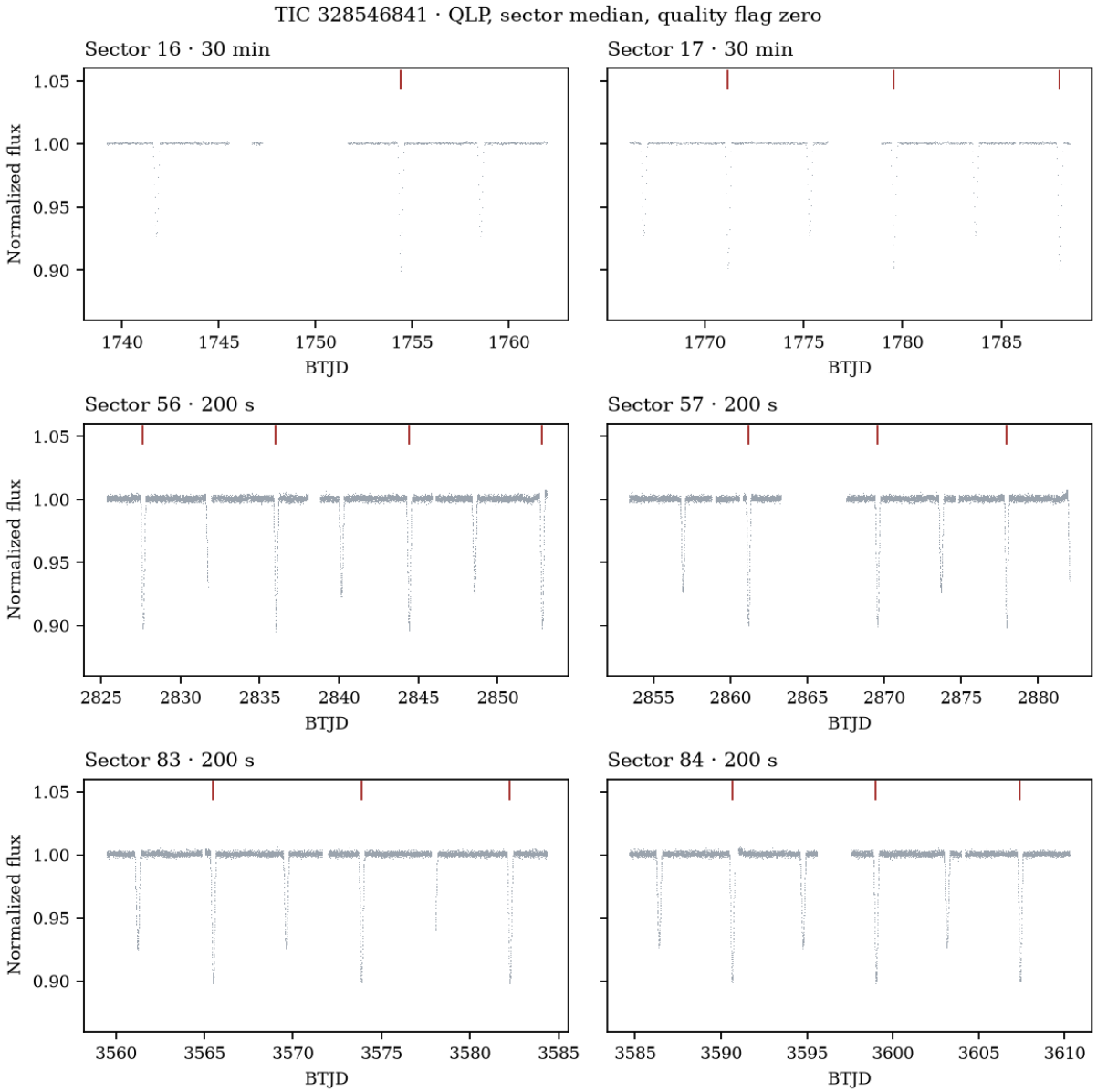

Figure 1. QLP light curves, quality-zero cadences, sector median. Red ticks are the deeper minima.

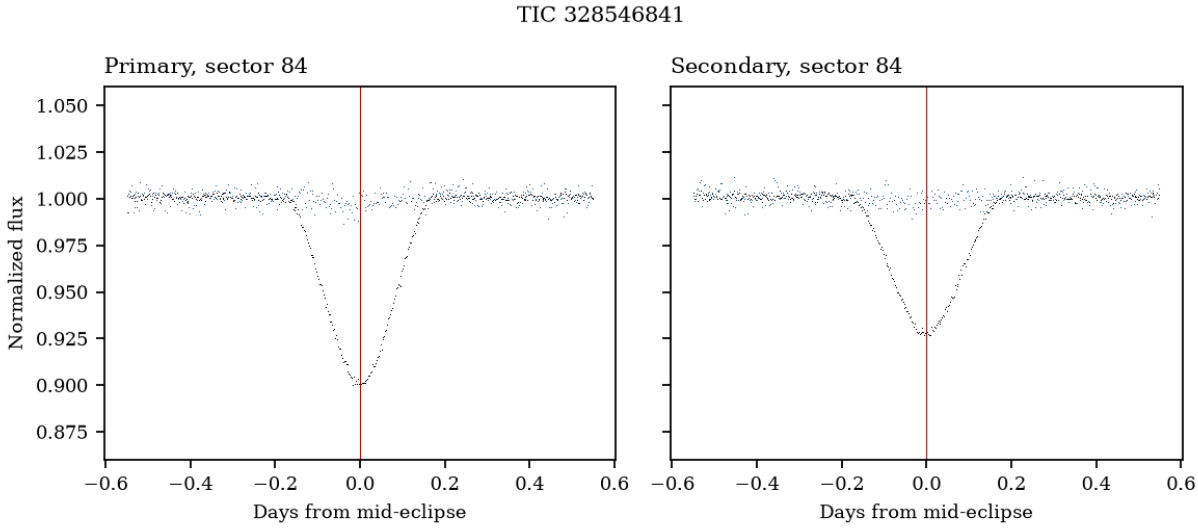

Figure 2. One primary and the phase-0.492 minimum in sector 84. Black is TIC 328546841. Blue is TIC 328546709, 96 arcsec away.

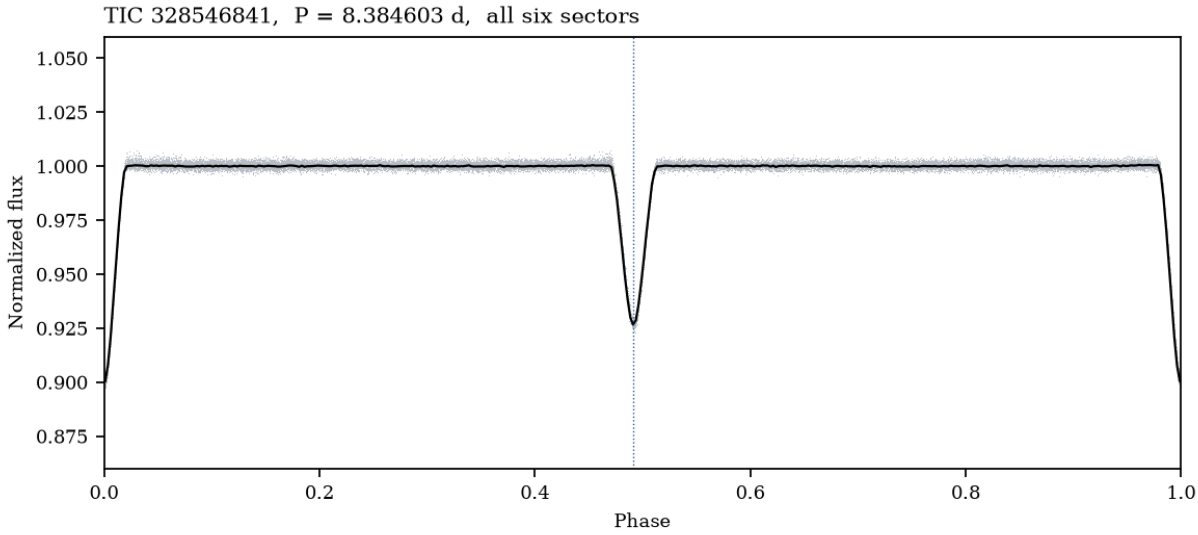

Figure 3. All six sectors folded on the period above. The dotted line marks the secondary.

4. The eclipse belongs to this star

Centroid shifts during the primary are 0.07 to 0.36 arcsec. The out-of-eclipse scatter is 0.33 to 0.87 arcsec, and the shift stays inside that scatter in every sector. The nearest Gaia star brighter than G = 15 is 46 arcsec away at G = 13.05 (Gaia DR3 2005652764055360768), 2.7 mag fainter than the target. A total eclipse of that star cannot supply a 0.12 mag drop in this aperture. TIC 328546709, V = 12.01, 96 arcsec away, stays at 0.997 of its normal light at the primary times. Its deepest single measurement in that test is 0.986.

An AAVSO VSX cone of 5 arcmin on 28 October 2026 does not contain this star. The nearest entry is Gaia DR3 2005652665266918272, type S, 56 arcsec away. ASASSN-V J220815.44+542856.3, an EB with period 1.2128 days, is 107 arcsec away and is a different clock.

5. Status

Not submitted to VSX. TIC 330739083 is the one star in review on this account. TIC 328546841 has not been checked from the ground.

6. The other new stars in this ring

See the notes for TIC 422108500, for the unresolved pair TIC 415460747 and TIC 2015971564, and for the candidate TIC 328548852.

7. The next minima

The secondary is taken at phase 0.492. Counted from 2026-10-29 04:25 UTC.

• primary: BTJD 4345.2496, 2026-10-31 17:54 UTC, 2026-10-31 10:54 PT

• secondary: BTJD 4349.3721, 2026-11-04 20:51 UTC, 2026-11-04 12:51 PT

• primary: BTJD 4353.6342, 2026-11-09 03:08 UTC, 2026-11-08 19:08 PT

• secondary: BTJD 4357.7567, 2026-11-13 06:05 UTC, 2026-11-12 22:05 PT

• primary: BTJD 4362.0188, 2026-11-17 12:23 UTC, 2026-11-17 04:23 PT

• secondary: BTJD 4366.1413, 2026-11-21 15:19 UTC, 2026-11-21 07:19 PT

• primary: BTJD 4370.4034, 2026-11-25 21:37 UTC, 2026-11-25 13:37 PT

The largest residual in Table 1 is 2.3 minutes. The primary lasts about 6 hours below 98 percent of normal light.

References

• Gaia Collaboration, 2023, A&A;, 674, A1 (DR3). ESA TAP cone, 28 October 2026.

• Huang C. X. et al., 2020, RNAAS, 4, 204 (QLP)

• Stassun K. G. et al., 2019, AJ, 158, 138 (TIC). MAST, 28 October 2026.

• Watson C., Henden A., Price A., 2006–, AAVSO VSX. Cone of 5 arcmin, 28 October 2026.